REMARKS

Applicant respectfully requests reconsideration of the present application in view of the reasons that follow. Claims 1-7 and 9-30 are now pending in this application.

Information Disclosure Statement

An Information Disclosure Statement and PTO/SB/08 form were submitted on March 1, 2010. Applicant respectfully requests that the next Office correspondence include a signed and initialed copy of the PTO/SB/08 form.

Rejections under 35 U.S.C. § 103

U.S. 3,844,777 in view of U.S. 3,966,506

Claims 1, 2, 4-6, 9, 10, 16-19, and 22-30 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 3,844,777 to Werner (hereafter "Werner") in view of U.S. Patent No. 3,966,506 to Mandigo *et al.* (hereafter "Mandigo"). This rejection is respectfully traversed.

Werner discloses fluxless brazing of aluminum in which the surface of an aluminum or aluminum alloy part is first pretreated by a chemical cleaning action to provide a "workably thin" oxide film. See Werner at col. 1, lines 8-52; col. 2, lines 18-30.

Werner discloses that aluminum and its alloys characteristically form a tenacious oxide on a surface, which is a detriment to brazing operations. Werner discloses in col. 1, lines 34-40, that prior art joining methods required "chemical cleaning of parts to be joined to remove thick oxide films" and the use of a separate flux during brazing (emphasis added). Werner states that the use of a flux aid wetting and flowing of filler material but that the flux itself creates problems, such entrapment of flux. See Werner at col. 1, lines 40-47. In light of this concern, Werner discloses a process that does not use a flux. See Werner at col. 1, lines 48-52.

However, the process of Werner, like the prior art methods discussed by Werner, still uses chemical cleaning to remove thick oxide films on aluminum and aluminum alloy parts to be joined. In particular, Werner discloses that the cleanliness of a surface to be joined is an

important factor and that a practical, successful fluxless brazing can be performed if surfaces are pretreated by "a chemical cleaning action which provides a 'workably thin' oxide film." See Werner at col. 2, lines 18-29. Werner discloses that "workably thin" means that the oxide is sufficiently thin to be penetrated by a fluxless filler alloy to allow a desired wetting and flowing action necessary for a brazed joint. See Werner at col. 2, lines 29-33.

Werner states that the nature of the chemical cleaning step depends on the alloy to be joined and the brazing alloy used. See Werner at col. 2, lines 33-38. For example, Werner states that 6061 and 2219 alloys are cleaned by immersion in a solution of nitric acid and hydrofluoric acid. See Werner at col. 2, lines 38-42. One of ordinary skill in the art would understand that such acids chemically reduce the oxides on the surfaces of these alloys, thus acting to reduce the thickness of the oxide or even remove the oxide.

Werner further discloses that the cleaning step is immediately followed by a cold water rinse and a flush with acetone and that the chemically cleaned parts "maintain their workable surfaces for a limited time" so brazing must be conducted within a short time after the cleaning step. See Werner at col. 2, lines 43-48. In addition, Werner teaches that effective brazing is "best carried out in vacuum" (see col. 2, lines 48-51) and that after the brazing alloy has melted and flowed the brazed part may be cooled in an inert atmosphere (see col. 2, lines 51-54). These steps of brazing within a short time, brazing in vacuum, and cooling in an inert atmosphere demonstrate Werner's aversion to thick oxides on the surface of an aluminum or aluminum alloy part and Werner's desire to chemically clean the surface to reduce the thickness of the oxide and make the oxide "workably thin."

For at least these reasons, Werner teaches a brazing process that uses a chemical cleaning step to reduce the thickness of an oxide on a surface of an aluminum or an aluminum alloy brazing piece so that brazing can be practical and successful. Thus, Werner does not disclose or suggest a soldering workpiece, wherein a thickness d of an oxide and/or hydroxide layer is greater than a native thickness of the oxide and/or hydroxide layer of an aluminum and/or aluminum compound formed in ambient air, as recited in claim 1. Claim 26 includes similar features. Nor does Werner disclose or suggest a soldering

process for joining at least two workpieces to one another comprising, among other things, providing a soldering workpiece made from aluminum and/or aluminum compounds, wherein the soldering workpiece has an oxide and/or hydroxide layer arranged at a surface of the soldering workpiece, wherein a thickness d of the oxide and/or hydroxide layer is up to 20 nm, and increasing the thickness d of the oxide and/or hydroxide layer, as recited in claim 22. Nor does Werner disclose or suggest a soldering workpiece, wherein the thickness of the oxide and/or hydroxide layer is greater than 25 nm, as recited in claims 1 and 26.

Mandigo discloses a process of providing adequate ductility for shaping an aluminum alloy sheet in which the aluminum alloy sheet is cold worked by at least 50% and then partially annealed for a sufficient time to accomplish recovery and recrystallization of 50-99%. See Mandigo at col. 2, lines 38-55. The Office argues on pages 2-3 of the Office Action that it would have been obvious to modify the process of Werner by the teachings of Mandigo to cold work and partially anneal the workpiece of Werner "prior to brazing in order to prevent grain coarsening during brazing." The Office argues on page 3 of the Office Action that such a modification would provide the workpiece of Mandigo with an oxide thickness greater than 25 nm.

The prior art must be considered in its entirety, i.e., as a whole, including disclosures that teach away from the claims, and that references cannot be combined where references teach away from their combination. See MPEP § 2141.02, Part VI; and § 2145, Part X(D)(2). Applicant respectfully disagrees that one of ordinary skill in the art would have modified the process of Werner by the teachings of Mandigo. Instead, one of ordinary skill in the art would have understood that Werner teaches against such a modification because Werner teaches the importance of a chemical cleaning step to reduce the thickness of an oxide so that it is "workably thin" and the maintenance of the chemically cleaned surface before and even immediately after brazing. The Office argues on page 3 of the Office Action that the combination of Werner and Mandigo would result in a thicker oxide for the process of Werner. However, a thick oxide is precisely what Werner is trying to avoid in order to provide a brazing process that is practical and successful. To accomplish this goal, Werner teaches the use of a chemical cleaning step that reduces the thickness of an oxide, the opposite of what the Office proposes with its modification.

In addition, Werner states the following in col. 2, lines 55-60 (emphasis added):

> Care should be exercised in the time-temperature cycle used to heat the work up to the brazing temperature since the workable surface produced by the chemical pre-cleaning operation may be destroyed by an overly long preheating cycle.

This teaching by Werner serves as a specific caution against preheating operations that would destroy the chemically cleaned surface by permitting the growth of the surface oxide, which the chemical cleaning step has already reduced.

Furthermore, one of ordinary skill in the art would not have combined the teachings of Werner and Mandigo, as argued by the Office, because one of ordinary skill in the art would have understood that such a proposed combination would have changed the principle of operation of the process of Werner, i.e., by increasing the thickness of an oxide instead of thinning the oxide, and that the proposed modification would render the process of Werner unsatisfactory for its intended purpose of brazing aluminum and aluminum alloy parts by increasing the thickness of the surface oxide.

Applicant notes that modifying the process of Werner by the teachings of Mandigo, which one of ordinary skill in the art would not have done for the reasons discussed above, would not necessarily prevent grain coarsening during brazing because the heat of a brazing process would provide heat that can be sufficient to cause grain coarsening, even if the grains were previously recrystallized and refined in size.

For at least the reasons discussed above, one of ordinary skill in the art would not have made the combination proposed by the Office and combined the teachings of Werner and Mandigo. Reconsideration and withdrawal of this rejection is respectfully requested.

U.S. 3,877,777 in view of "Toh"

Claims 1, 2, 4-6, 9, 10, 16-19, and 22-30 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Werner in view of "An Investigation of the Native Oxide of Aluminum Alloy 7475-T7651 Using XPS, AES, TEM, EELS, GDOES and RBS" by Toh *et al.* (hereafter "Toh"). This rejection is respectfully traversed.

Toh studied the native oxide of hot rolled Al alloy 7475-T7651, not the native oxide of an aluminum alloy under ambient conditions. See Toh at page 370, under "4. Discussion and Conclusions." One of ordinary skill in the art would understand that hot rolled aluminum would have a thick scale of oxide due to the highly oxidizing conditions of high temperature in an environment of air that the aluminum would experience during a hot rolling process.

As discussed above, Werner teaches against thick oxides and instead teaches a chemical cleaning step to reduce or thin an oxide to provide a successful brazing operation. Therefore, one of ordinary skill in the art would not have modified the process of Werner by the teachings of Toh, which provides a hot rolled aluminum alloy with a thick oxide.

Further, hot rolling conditions are not ambient conditions that normally produce a relatively thin layer of oxide the surface of aluminum and aluminum alloys. Native oxides produced by ambient conditions are discussed in Applicant's specification at page 3, lines 28-36:

> The native oxide and/or hydroxide layer, which is formed on all the surfaces of workpieces made from aluminum or aluminum compounds that are exposed to ambient air, usually has a thickness of less than 10 nm and may be up to 20 nm thick in the case of humid air. On account of this low thickness, the oxide and/or hydroxide layer has a flexibility, so that the thermal stresses within the oxide and/or hydroxide layer can be dissipated.

The thick scale produced by the highly oxidizing conditions of hot rolling would not be a native oxide formed by conditions in ambient air. One of ordinary skill in the art would have understood that such a hot rolled workpiece would not be suitable for a brazing process, particularly in light of Werner's teachings that aluminum and aluminum alloys must be chemically cleaned to remove thick oxide films. See Werner at col. 1, lines 32-40, and col. 2, lines 18-60.

Furthermore, the Office argues on pages 16-17 of the Office Action that aluminum alloy 7475 of Toh would be sufficiently similar to the alloys of Werner, including alloys 6061 and 2219 in the Table of Werner, because these alloys share magnesium and zinc as common alloying elements. However, the Office does not properly consider the effects of additional

elements not shared by these alloys or different amounts of alloying elements, which can also affect the oxidation properties of these alloys.

For at least the reasons discussed above, one of ordinary skill in the art would not have made the combination proposed by the Office and modified the process of Werner by the teachings of Toh. Reconsideration and withdrawal of this rejection is respectfully requested.

Claim 3

Claim 3 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Werner in view of Mandigo or Werner in view of Toh, and further in view of U.S. Patent No. 3,986,897 to McMillan *et al.* (hereafter "McMillan"). This rejection is respectfully traversed. McMillan fails to remedy the deficiencies of Werner, Mandigo, and Toh discussed above in regard to independent claim 1, from which claim 3 depends.

Claims 7, 11-13, 15, and 20

Claims 7, 11-13, 15, and 20 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Werner in view of Mandigo or Werner in view of Toh, and further in view of U.S. Patent No. 3,747,199 to Swaney, Jr. (hereafter "Swaney"). This rejection is respectfully traversed. Swaney fails to remedy the deficiencies of Werner, Mandigo, and Toh discussed above in regard to independent claim 1, from which claims 7, 11-13, 15, and 20 depend. Reconsideration and withdrawal of this rejection is respectfully requested.

Claims 14 and 21

Claims 14 and 21 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Werner in view of Mandigo or Werner in view of Toh, and further in view of U.S. Patent No. 5,618,357 to Knepper *et al.* (hereafter "Knepper"). This rejection is respectfully traversed. Knepper fails to remedy the deficiencies of Werner, Mandigo, and Toh discussed above in regard to independent claim 1, from which claims 14 and 21 depend. Reconsideration and withdrawal of this rejection is respectfully requested.

Conclusion

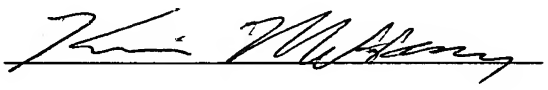
Applicant submits that the present application is now in condition for allowance. Favorable reconsideration of the application is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date March 8, 2010

By 

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